

REMARKS

In response to the Office Action dated 20 December 2004, the applicant requests reconsideration of the above-identified application in view of the following remarks. Claims 14-43 are pending in the application. Claims 14-18, 20-28, 31-37, and 39-42 are rejected, and claims 19, 29, 30, 38, and 43 are objected to. None of the claims are amended herein.

Allowable Subject Matter

The Office Action indicated that claims 19, 29, 30, 38, and 43 would be allowable if rewritten in independent form. The applicant reserves the right to rewrite claims 19, 29, 30, 38, and 43 in independent form, but believes that all of the claims are allowable in view of the remarks made herein.

Rejections of Claims Under §103

Claims 14-15, 18, 20, 23, 26, 31, 34-37, and 41-42 were rejected under 35 USC § 103(a) as being unpatentable over Master (U.S. 6,229,207 B1) in view of Bross et al. (U.S. 5,303,862, Bross). The applicant respectfully traverses.

Master issued on May 8, 2001, which less than one year before the 27 September 2001 filing date of the parent of the present application. The applicant does not admit that Master is prior art, and reserve the right to swear behind Master at a later date.

The MPEP requires a suggestion and a reasonable expectation of success for a rejection under 35 USC § 103:

“To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations.”¹

¹ MPEP 2143.

The suggestion or motivation to combine references and the reasonable expectation of success must both be found in the prior art.²

Master relates to a pin grid array flip chip package.³ Master shows in Figure 2 a pin lead 30 joined to a conductive pad 28 by a solder fillet 36. The conductive pad 28 extends from a substrate 22.⁴ Master shows in Figure 3 a device assembly including a substrate 42 from which conductive pads 52 extend. Master shows pins 54 electrically and mechanically joined to the conductive pads 52 by solder fillets 56.⁵ Each pin of Master is soldered to a conductive pad that is fixed on a substrate. The Office Action states:

“Master lacks anticipation of a separate portion of encapsulation material surrounding a solder joint associated with each of the individual pins.”⁶

Bross relates to a multilayer structure and shows a substrate 1 with “a plurality of pins 2 positioned therein.”⁷ “A polymer layer 3 is applied on the substrate 1 and solder or braze 4 is positioned at the top of the pins 2....The polymer layer 3 surrounds the solder 4 and does not extend over the top of the solder 4.”⁸ An electronic device 5 is joined to the substrate 1 by compression and heating to form a package. As a result, the polymer layer 3 fuses with the device 5 and forms a strong chemical bond with the substrate 1.⁹

The Office Action states:

“It would have been obvious ... to modify Master by having a separate portion of encapsulation material surrounding a solder joint associated with each of said individual pins, as taught by Bross, because the encapsulation material protects the solder which connects the pins to the pads (Bross-col. 4, lines 42-44).”¹⁰

The structure of Bross is very different from that of Master, and one skilled in the art would not have been motivated to modify Master after reading Bross. The polymer layer 3 of Bross is sandwiched between the substrate 1 and the device 5, and is heated to fuse with the

² MPEP 2143.

³ Master, Title.

⁴ Master, column 5, lines 19-26.

⁵ Master, column 5, lines 45-63.

⁶ Office Action, page 3.

⁷ Bross, column 3, lines 26-29.

⁸ Bross, column 3, lines 42-52

⁹ Bross, column 3, line 58 to column 4, line 2.

¹⁰ Office Action, pages 3-4.

device 5 and form a chemical bond with the substrate 1.¹¹ A quote from Bross immediately following the lines cited in the Office Action illustrates the difference from Master:

“The process is especially useful in connecting pins 2 to devices 5 with densely packed circuitry since a very strong mechanical connection of the substrate 1 to the device 5 is accomplished with the polymer layer 3 and movement of the pins 2 is significantly reduced.”¹²

The movement of the pins 2 in Bross is reduced because the substrate 1 is mechanically connected to the device 5, not because of the location of the polymer layer 3. The polymer layer 3 in Bross provides the mechanical bond between the substrate 1 and the device 5.

The modification of Master proposed by the Office Action would put the polymer 3 of Bross to a very different use, and the Office Action has not identified a reasonable expectation of success in the prior art of this modification as is required by MPEP 2143. For example, the pins 30, 54 of Master are free-standing, not embedded in a substrate as in Bross. The Office Action has not shown how the polymer 3 of Bross would be applied to the solder fillets 36, 56 of Master with a reasonable expectation of success. The polymer would not be sandwiched between two surfaces in Master, but would apparently be solely on the surface of the solder fillets 36, 56 and the free-standing pins 30, 54. The Office Action has not shown how the polymer 3 of Bross so applied to Master would protect the solder because in Master the polymer 3 would not be sandwiched between two layers. The Office Action has not presented prior art showing a reasonable expectation of success of such a structure.

Master indicates no need for additional protection of the solder fillets 36, 56. Master, in fact, teaches away from this modification proposed in the Office Action. Master teaches that its solder fillet 36 forms “a mechanically strong joint between the pin lead and the conductive pad with little or no solder on the shaft.”¹³ In fact, Master wants to avoid getting solder on the pin shaft because it interferes “with fitting the carrier member into a socket” and can “contaminate testing apparatus.”¹⁴ The Office Action has not shown how adding the polymer of Bross to the pin joint of Master would avoid getting polymer on the pin shaft of Master. Such added polymer

¹¹ Bross, column 3, line 58 to column 4, line 2.

¹² Bross, column 4, lines 44-49.

¹³ Master, column 5, lines 37-45.

¹⁴ Master, column 4, line 65 to column 5, line 10.

on the pin shaft of Master could lead to the problems of fitting and contamination that Master is trying to avoid. The Office Action has not presented prior art showing a reasonable expectation of success of such a structure. The Office Action has not identified a reasonable expectation of success in the prior art as is required by MPEP 2143.

The applicant respectfully submits that a *prima facie* case of obviousness against claims 14-15, 18, 20, 23, 26, 31, 34-37, and 41-42 has not been established in the Office Action, and that claims 14-15, 18, 20, 23, 26, 31, 34-37, and 41-42 are in condition for allowance.

Claims 17 and 22 were rejected under 35 USC § 103(a) as being unpatentable over Master in view of Bross and Bronson et al. (U.S. 5,288,944, Bronson). The applicant respectfully traverses.

Bronson relates to a pinned ceramic chip carrier.¹⁵ Bronson discusses an epoxy resin, and in particular cyclohexyldiepoxy resin.¹⁶ The Office Action states:

“it would have been obvious ... to modify the combination of Master and Bross by using an epoxy resin for the encapsulation material, since epoxy resins such as cyclohexyldiepoxy resin are polymers.”¹⁷

The Office Action has not identified prior art as being the source of the above-quoted rationale for combining Master, Bross, and Bronson as is required by MPEP 2143. The Office Action has also not identified a reasonable expectation of success for this combination in the prior art as is required by MPEP 2143. The Office Action has not shown that the cyclohexyldiepoxy resin would stand up to the pressure and heat applied in Bross, or that the cyclohexyldiepoxy resin would fuse with the device 5 or form a strong chemical bond with the substrate 1 in Bross.

The applicant respectfully submits that a *prima facie* case of obviousness against claims 17 and 22 has not been established in the Office Action, and that claims 17 and 22 are in condition for allowance.

¹⁵ Bronson, Title.

¹⁶ Bronson, column 8, lines 43-47.

¹⁷ Office Action, pages 4-5.

Claims 16, 21, 24, 25, 27, 28, 32, 33, 39, and 40 were rejected under 35 USC § 103(a) as being unpatentable over Master in view of Bross and Elenius et al. (U.S. 6,578,755 B1, Elenius). The applicant respectfully traverses.

Elenius issued on June 17, 2003, which after the 27 September 2001 filing date of the parent of the present application. The applicant does not admit that Elenius is prior art, and reserve the right to swear behind Elenius at a later date.

Elenius relates to a polymer collar for solder bumps.¹⁸ Elenius describes no-flow underfill polymer materials.¹⁹ The Office Action states:

“It would have been obvious ... to modify the combination of Master and Bross by using an encapsulation material, as taught by Elenius, since the encapsulation material is a polymer.”²⁰

The Office Action has not identified prior art as being the source of the above-quoted rationale for combining Master, Bross, and Elenius as is required by MPEP 2143.

The applicant respectfully submits that a *prima facie* case of obviousness against claims 16, 21, 24, 25, 27, 28, 32, 33, 39, and 40 has not been established in the Office Action, and that claims 16, 21, 24, 25, 27, 28, 32, 33, 39, and 40 are in condition for allowance.

¹⁸ Elenius, Title.

¹⁹ Elenius, columns 5-6.

²⁰ Office Action, page 6.

CONCLUSION

The applicant respectfully submits that all of the pending claims are in condition for allowance, and such action is earnestly solicited. The Examiner is invited to telephone the below-signed attorney at 612-373-6973 to discuss any questions which may remain with respect to the present application.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.

Respectfully submitted,

MICHELE J. BERRY

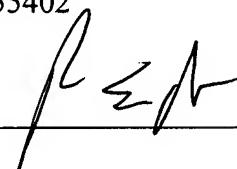
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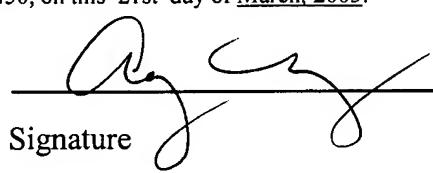
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CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail, in an envelope addressed to: MS Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on this 21st day of March, 2005.